

# Choosing a career in science and technology

Citation for published version (APA):

Tacsir, E. (2010). *Choosing a career in science and technology*. UNU-MERIT, Maastricht Economic and Social Research and Training Centre on Innovation and Technology. UNU-MERIT Working Papers No. 014

## Document status and date:

Published: 01/01/2010

## Document Version:

Publisher's PDF, also known as Version of record

## Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
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## Working Paper Series

**#2010-014**

### **Choosing a career in Science and Technology**

**Ezequiel Tacsir**

**UNU-MERIT Working Papers**  
**ISSN 1871-9872**

**Maastricht Economic and social Research and training centre on Innovation and Technology,  
UNU-MERIT**

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# Choosing a career in Science and Technology\*

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March 13, 2010

## Abstract

Student choice is at the center of many discussions about higher education policy. At the same time, and regardless of the emphasis put on achieving an important endowment of graduates trained in science and engineering, participation in these fields is stagnated or declining. Evidence suggests that the provision of additional scholarships for science and engineering students or abolishing the tuition fees will have practically no impact. The major problem seems to be that science and engineering programs suffer from a poor image, including as being difficult, leading to lower earning potentials than other specializations. The present study contributes to our understanding of the student choice process by highlighting by means of binomial probit with selection model (Van den Ven and Van Praag, 1981) the factors and dimensions that influence the choice of field of study. Specifically, we will show the role that non-pecuniary rewards play in the selection process. Using results from a self-designed survey to young individuals finishing high school in Argentina, we show that when factors as the social respect and expected labour demand are considered, the income expectations become irrelevant for the decision about what type of career to follow at the university. Specifically, those inclined towards science, technology and engineering fields are motivated by the belief of obtaining important rewards in the form of social rewards (i.e., reputation) and the expectation of graduating from a highly demanded university career.

JEL codes: J44, J48, J24, I21.

Keywords: Occupational Choice, Professions, Public Policy.

## 1 Introduction

Student choice is an important topic in higher education policy. In developed countries it is also often a subject of heated policy debates, particularly when financial issues like

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\*I would like to thanks all those who took the time and effort to answer the survey used here. Alejandra Di Franco, Patricia Flores and Fabiana Cereseto assist me in the collection of the data. BETA, Bureau d' Économie Théoretique et Appliquée (Université Louis Pasteur), financed partially this project. CFI contributed with its interest to this project. Stephan Robin, Lex Borghans, Giacomo Corneo, Pierre Mohnen, Lucas Luchilo and Mariana García provided ideas and comments to the design of the survey used here. Patrick Llerena, Robin Cowan and Irina Soboleva contributed with useful advise and suggestions. A previous version of this paper was presented at the 7th Globelics Conference, Dakar, 6-8 October 2009. All mistakes remain mine. Corresponding author: [tacsir@merit.unu.edu](mailto:tacsir@merit.unu.edu)

tuition fees and student support are concerned (Vossensteyn, 2005). In many developing countries, the concern about access and expansion is moving towards highlighting the lack of an adequate number of graduates in scientific and technical fields (RAND, 2001; TWAS, 2004; World Bank, 2002). Regardless of the worldwide emphasis of public opinion on the importance of science and engineering for the knowledge society, participation in most traditional science and engineering programs is declining and the growing participation in new science and engineering programs cannot make up for that decline.<sup>1</sup> Providing additional scholarships for science and engineering students is shown to have practically no impact. The universities of technology experimented with giving students additional scholarships and financial guarantees in cases of dropout but this did not attract extra students. Simulation studies show that abolishing tuition fees might increase enrolments in science and engineering programs by 7% at most (Vossensteyn, 2005).

The literature on social exclusion is full of testimony from students who admit that they made the wrong decisions in their earlier years, partly because they did not know the consequences of their decisions, or did not heed the warnings of teachers and counselors to develop clearer plans (Gandara and Bial, 1999; King, 1996; McDonough, 2004; Rosenbaum, Miller and Krei, 1996; Venezia et al., 2003). Also, different contributions on economics – Borghans and Golsteyn (2006), Miller (1984), Neal (1999), Sicherman and Galor (1990), Topel and Ward (1992), to name a few – show that changes of occupations and inclining for for a field of occupation different from the one the individual has graduated are a common feature for young individuals. In some of these cases, the problem is not simply that they were uninformed about career alternatives and schooling prerequisites; they were also unaware that they needed to know this information in order to make well-informed decisions (Grubb, 2002). Here, we take as our starting point that choosing an occupation requires combining different sources and types of information. This information will be acquired and transformed differently depending the identity and background of the concerned individual. In this sense, the present study will try to fill the gap in our understanding of the student choice process by highlighting the factors and dimensions that influence the choice of field of study. Specifically, we will highlight the role that non-pecuniary rewards have in the selection process.

Many public policies, and many providers of counseling and career guidance services seem to assume that information about careers and about educational pathways into careers is sufficient for individuals to make considered decisions. But decision-making is a much more complex process. Even in the model of rational decision-making that economists use, the requirements for rational decision-making are substantial: (1) Individuals need to have stable preferences, which for young people who are unfamiliar with the world is a substantial barrier. (2) Individuals need to know their preferences about an enormous range of options including those that are completely unfamiliar to them. (3) Individuals need to have a sense of time, of trading current costs against future benefits. (4) Individuals must be able to think probabilistically, about the differences between high-probability and low-probability events including low-probability events with high payoffs (like becoming a football star). (5) Individuals need to be able to judge the reliability of information they receive. In this setting, the provision of information may be necessary but not sufficient for self-interested decisions.

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<sup>1</sup>Arnoux et al (2008), Biernans et al (2005), Ertl (2005), Romer (2000) analyze the cases of France, the Netherlands, Germany and the US, respectively

## 2 Student choice models

Literature on student choice recognises that choices to attend higher education are complex multistage processes involving a series of successive decisions that result in the decision to attend or not attend higher education (Hossler et al., 1989). Generally, the student choice process is divided into three broad stages:

1. attending higher education or taking up other activities like work (predisposition);
2. learning about specific institutions and their characteristics (search);
3. choosing a particular higher education program, institution or mode of study, and once enrolled, choosing whether or not to persist (choice).

Three categories of theoretical models can be distinguished in the realm of student choice (Hossler et al., 1999):

**Status-attainment models** (also called sociological models), are based on sociological theory that students choose according to what they think is expected from them. These models focus on the socialisation processes that shape the possibilities and ambitions of students since they were born, including family conditions, peer interactions, and school environments. Different variables may have interactive effects at different stages in the college choice process and the influence of such variables may change over time. The sociological models generally leave financial factors out of the analysis and instead utilise the following groups of independent variables to explain student choice:

1. Behavioural variables: student's academic performance, student's aspirations, spending of leisure time, motivation;
2. Background variables: family background characteristics (parental encouragement, parents income, education and occupation), gender, ethnicity, and influence of peers (e.g. teachers, friends).

**Economic college choice models** are rooted in the assumption that prospective students are rational actors who make careful cost-benefit analyses. These models, in turn, argue that students choose to attend higher education and select particular institutions or programs if and only if the perceived benefits of that choice outweigh the perceived benefits of other alternatives (opportunity costs). Economic college choice models focus on how individuals with certain characteristics (e.g. gender, ability and parental socio-economic status) differ in the extent to which financial variables are deemed important in choosing post-secondary education. In the process of decision-making, individuals face trade-offs and value (the costs and benefits of) various college characteristics (Hossler et al., 1999). Although economic models use many variables that are sociologically based, the models are focused on financial incentives and thus concentrate on the monetary costs and benefits of higher education. The major explanatory variables used in economic models include (Hossler et al., 1989):

- Monetary costs: tuition fees, net tuition fees (tuition fees minus financial support), other study costs (e.g. books and equipment), costs of living, and foregone earnings (opportunity costs);

- Monetary benefits: expected or future earnings, grants/scholarships;
- Intervening non-financial factors

**Information-processing models** are a third class of college choice models. Neither status-attainment nor economic models provide satisfactory explanations for enrolment decisions in the sense that they each focused on a limited range of explanatory variables. Therefore, the most powerful indicators in the different stages of the decision-making process have been combined in the information processing models. Such combined models have also been developed to better explain the effects of institutional recruitment efforts and policy interventions. The combined models have been extended by the idea of information-processing. In this perspective, college choice is regarded as a continuous cyclical process of uncertainty reduction in which prospective students make successive decisions, based on incomplete information, and then treat the outcomes of one stage as inputs to the next stage. The starting point in the information-processing model is the student's particular social setting. The model introduces the (long-run) dynamic roles of parents, peers and schools in collecting and using information about college choice (Hossler et al., 1999). Prospective students' social capital is believed to be influenced by background characteristics (e.g., ability) and family factors (e.g., parents income and education), but also by the preferences and attitudes transmitted to children, and the way in which parents motivate their children, such as through encouragement of reading, critical thinking and college attendance. As a result, college choice is seen as a process that starts early and requires different sets of information at different times. Collecting and processing information enables students to reduce uncertainty about colleges and programs considered and applied to.

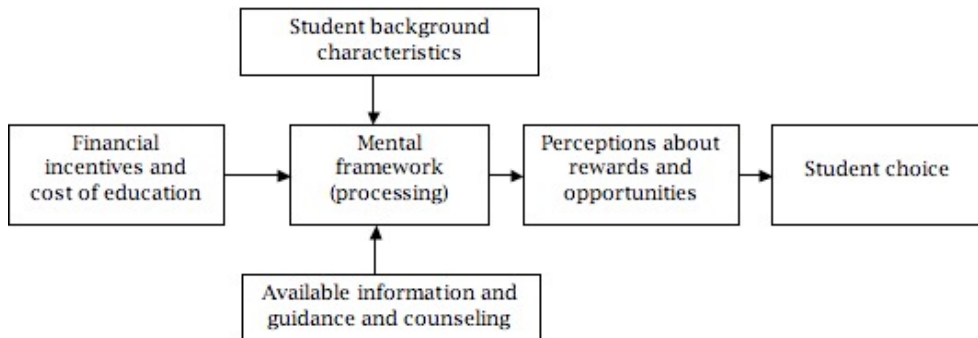


Figure 1: A simple perceptions model of rewards conditioning student choice. Adapted from Chapman (1984) and Hossler et al (1999).

Altogether, the information-processing (or combined) models are the most extensive student choice frameworks, including various choice stages and an extensive set of explanatory variables that are deemed important in the various stages of the student college decision-making process.

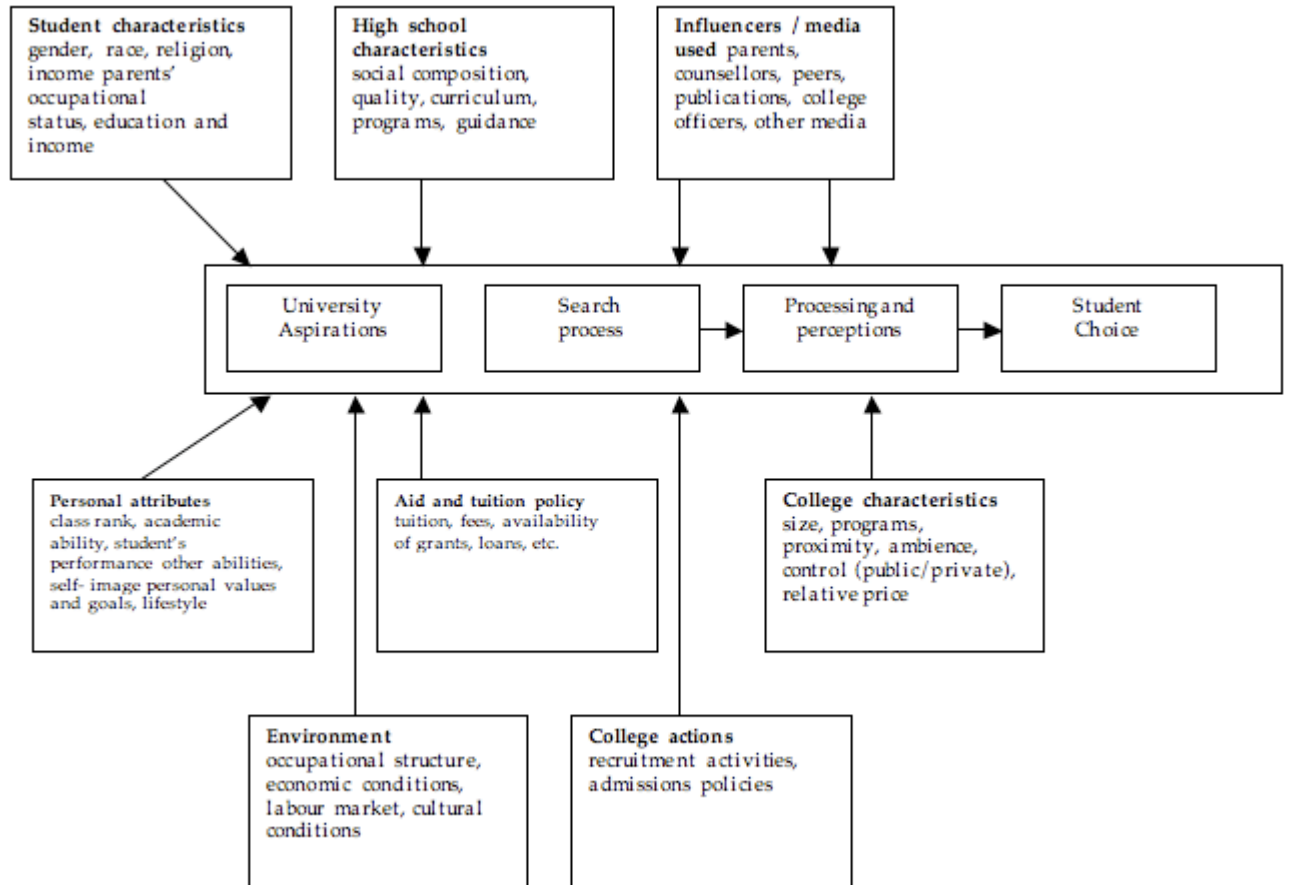


Figure 2: Student choice model and its determinants variables and dimensions. Adapted from Vossensteyn (2005).

### 3 Received literature

Traditionally, the literature has focused mostly on the study of educational attainment by recurring to either cross-section or longitudinal micro data. Most of these studies were able to show the existence of a correlation between parents' and children's incomes and education. However, there is much less empirical evidence on the effect of family and social background on the choice of subject at the tertiary level. Specifically, there are only a few studies that address the effects that social class might have on the choice by recurring to individual-level information. Oosterbeek and Webbink (1997) found for the Dutch case that children from high income families were less likely to enroll in technical fields, but were more likely to persist in their choice once they had undertaken a technical education. Similar results are presented by Van de Werfhorst et al. (2001) who found, again for the Netherlands that children of the cultural elite were more inclined to enroll in fields where



they could acquire cultural capital (i.e., non technical skills), while students from the economic elite were under-represented in cultural fields (such as arts and humanities). By contrast, low social class individuals were over-represented in economics and engineering. In relation to this point, Davies and Guppy (1997) analysed US micro data to find that high ability and low social class individuals were more likely to enter high-return fields. Van de Werfhorst et al. (2003) estimated for the 1958 cohort in the UK a multinomial logit model of subject of graduation considering six broad subject categories and including among the explanatory variables family background variables (such as parental social class and measures of economic and cultural capital), ability, and measures of comparative advantage. The authors found that children from professional backgrounds preferred faculties of medicine and law, even after controlling for ability. However, they did not find other social class differences, which the authors themselves stated were due to the specific characteristics of the cohort studied. In fact, at the time of the study only a very small minority of the working class entered higher education. For the same country, Bratti (2006) did not find statistically significant differences among social classes in the probability of enrolling in different subjects. Boudarbat (2004) find using Canadian data that fathers favour studies in Sciences while mothers favour studies in Health.

In relation to earnings expectations, Kelsall et al. (1972) showed that lower social class students may be more inclined to choose subjects that offer better labour market prospects, being this confirmed by Hansen (2001). Boudarbat (2004) found for the case of Canada that expected earnings significantly influence the choice of the college field, a fact which agrees with previous studies in the country such as Berger (1988), and Montmarquette, Cannings and Mahseredjian, (2002). Similar evidence is presented by Arcidiacono (2004 and 2005). Specifically to gender, the same author finds that women –similar to Montmarquette, Cannings and Mahseredjian (2002)– are less influenced by earnings than men are. Berger (1988) argue that students are likely to select fields of study associated with greater streams of future earnings rather than fields with higher beginning earnings. Yet, other studies support the view that starting wages are important in students' choices.

Of course, pecuniary variables are not the unique variables that drive students choices. Nonmarket variables such as interests, consumption value and abilities also exert a significant impact on those choices (see for example Fiorito and Dauffenbach, 1982). Beffy, Fougere and Maurel (2009) assess the sensitivity of students choice of major to expected earnings by estimating a semi-structural model of post-secondary educational choices in the case of France. These authors state that the choice of a major of study is mainly driven by the consumption value of schooling which is related both to schooling preferences and abilities, rather than by its investment value. That paper provides strong evidence that nonpecuniary factors are a key determinant of schooling choices. From a policy point of view, it suggests that the solution to the shortage for some skills, mainly scientific in the European context, does not lie principally in financial incentives. The solution probably lies upstream, within formation of preferences and abilities at school.

In this same line, this paper will focus on highlighting by means of binomial probit with selection model (Van den Ven and Van Praag, 1981) the role that beliefs and expectations about both pecuniary (wages and labor demand) and non-pecuniary rewards (social value and individual respect) play on the choice of field of study. Using results from a self-designed survey to young individuals finishing high school in Argentina, we show that when factors as the social respect and expected labour demand are considered, the income expectations become irrelevant for the decision about what type of career to follow at the university. Specifically, those inclined towards science, technology and engineering fields are motivated by the belief of obtaining important rewards in the form of social rewards (i.e., reputation)

and the expectation of graduating from a highly demanded university career.

The remainder of the paper is organized as follows. Section 4 describes the main features of the pool of surveyed individuals and its relation with the country’s high school students. Section 5 focuses on presenting the interviewees’ most preferred university careers and the correspondence with their background and suggestions received. This is complemented with the characterization presented on Section 6 dealing with the perceptions and beliefs about the most popular careers at the university level in the country. Section 7 presents a characterization of the students opting to follow a career in Science and Technology and their perceptions in comparison to those students choosing different fields of science. Section 8 presents an econometrical analysis of the the factors that influence the choice. Finally, Section 9 present conclusions.

## 4 Data description

The data used in this paper comes from a specially designed survey that was conducted during the first week of November 2008 to individuals enrolled in their last year of secondary school in the province of Río Negro, Argentina. Taking into consideration that the academic year finishes in the country in mid-November, the surveyed individuals were already confronted with the need to decide about their future plans. In this sense, it is expected that they were involved in activities aimed at collecting information and suggestions and have arrived to a quite robust decision. The students were surveyed at their schools during the normal hours.

### 4.1 Main characteristics of the interviewed population

Located in the Patagonian region of Argentina, Río Negro province contains 1.5% of the country’s population and 1.9% of the secondary high school students. The secondary level students represents 35.7% of the total student population living in the province and 11.9% of the total inhabitants. According to the latest information available, the province of Río Negro presented slightly more than 5,000 students on their last year of secondary education, while the latest population census reported that 53.4% were females and 46.6% males (INDEC, 2001). In this respect, our pool of 741 respondents presents a distribution that matches this information at the provincial level: 55% of our survey respondents were females (411 cases) and the remaining 45% to males. In relation to the sector of education, the province is endowed with 129 secondary schools of which 88 are public (68%) and remaining 41 (32%) are private. The public sector concentrates 70.4% of the students, being the rest enrolled in private institutions. Our surveyed sample presents an almost identical distribution of students (69% and 30.9% of the students, respectively). Table 1 shows the distribution of our interviewees in respect to their gender and type of high school that they attend.

<b>Gender</b>	<b>Type of school</b>		
	Private	Public	Total
Female	137	274	411
Male	92	238	330
Total	229	512	741

Table 1: Interviewee’s distribution by type of school and gender

Argentina being federally organized, the different provinces<sup>2</sup> are responsible for financing and administering their education system. At the same time, there are no final year tests, nor a student register where her past performance and grades are recorded. In the particular case of the province of Río Negro, education includes 9 years of compulsory education.<sup>3</sup>

The information provided by international tests (such as PISA) permits us to characterize the performance of the Argentine education system as a whole in terms of its output and main features. Table 2 shows the position that Argentina obtained in the language test for LAB (1997), PISA (2000), PIRLS (2001) and PISA (2006).<sup>4</sup> There we observe that the relative good performance at the regional level, vanishes when a larger set of countries, with a high participation of developed countries, is included.

<b>Ranking</b>	<b>LAB (3rd)</b> (1997)	<b>LAB (4th)</b> (1997)	<b>PISA</b> (2000)	<b>PIRLS</b> (2001)	<b>PISA</b> (2006)
LATAM sub-sample	2 / 13	3 / 13	2 / 5	2 / 2	4/7
Total Sample	2 / 13	3 / 13	34 / 41	31/ 35	51/57

Table 2: Performance of Argentina in International Tests. Its ranking in relation to Latin American countries and the whole pool of participant countries.

A striking figure for Argentina is the difference in performance between high socioeconomic level and low socioeconomic level students. According to PISA 2000, the 25% with highest socioeconomic status (SES) in Argentina has an average score which is 104 points higher than the lowest 25% students (379 and 483 points, respectively). This is the largest difference among the Latin-American countries included in the sample, and well above the difference for OECD countries. While in Argentina the difference represents 27.4% of the scores for the lowest SES, in the OECD is only 17.7%. Also note that the top 25% in Argentina is closer to OECD average (62 points below) than to the lowest 25% (84 points). See Table 3 for details.

The province of Río Negro is in the group of top performers in the country. Table 4 shows

<sup>2</sup>More precisely, 23 provinces and an autonomous federal district.

<sup>3</sup>The early nineties brought important modifications to the education policy and administration in the country. First, in 1991 the administration of all federal secondary schools was transferred to the provincial governments by law. Secondly, the enactment of the Ley Federal de Educacin (April 1993) introduced a second set of reforms, among which a significant change in the structure of the educational curricula and the extension of mandatory education stand out. In terms of structure the bill set four different cycles of identical length. The final three years of compulsory education are called “multimodal” and are supposed to provide more specific skills and knowledge oriented towards specific disciplines or careers. Such an innovation produced that the number of specialisations offered to be much wider and many times labeled following some marketing principles. At the same time, this modification implied that some students have not taken courses in some subjects (such as sciences, maths, for example) since they have completed the 9th grade. Although the law was to be complied in all provinces, this legislation was implemented with a substantial variation in terms of timing and intensity across provinces. While in some states the reforms were quickly and massively implemented, in others the changes were put into effect more gradually and involving a much smaller percentage of schools. Specifically, the province of Río Negro never implemented the law in its educational structure.

<sup>4</sup>The Programme for International Student Assessment (PISA) is an internationally standardised assessment that was jointly developed by OECD countries and administered to 15-year-olds in schools. Three assessments have so far been carried out (2000, 2003 and 2006). Tests are typically administered to between 4,500 and 10,000 students in each country. PIRLS, an international test conducted by the the International Association for the Evaluation of Educational Achievement (IEA) stands for “Progress in International Reading Literacy Study”. The target grade is the upper of the two adjacent grades with the most nine-year-olds. In most participating countries this is Grade 4. Laboratory covered 13 Latin American countries, and the test was administrated for a sample of 3rd and 4th grade students. Annex A presents the list of countries participating in each of these international comparisons.

<b>Results on PISA (2000) by socioeconomic status</b>					
<b>Countries</b>	<b>0-25%</b>	<b>25%–50%</b>	<b>50%–75%</b>	<b>75%+</b>	<b>Top - lowest</b>
Argentina	379	393	440	483	104
Brazil	368	387	413	435	67
Chile	373	388	420	466	93
Mexico	385	408	435	471	86
Peru	283	317	338	383	100
Avg. OECD	463	491	515	545	82

Table 3: Performance in PISA 2000 according the socioeconomic status quantiles. Source: Auguste et al. (2008) based on PISA, Argentina country report.

the percentage of students with a performance considered either “medium” or “high” for the province and the national average in three different subjects: language, maths and natural sciences. There, even when the student performance is relatively lower in maths at every level, we can observe that Río Negro outperforms the country performance at every level and subject considered. At the same time, the performance at the provincial level is quite homogeneous. Computing the coefficient of variation at province level (ratio of standard deviation of individual test score at province level to average score at province level), the province presents values of 17.5 and 17.8 for maths and languages tests, respectively. In both cases the city of Buenos Aires presents the smaller variation (17.1 and 15.8, respectively), ranking Río Negro on the second and fifth places, respectively.

	<b>Language</b>		<b>Maths</b>		<b>Natural sciences</b>	
	Country	Río Negro	Country	Río Negro	Country	Río Negro
3rd grade	68.9	81.1	61.3	73.7	74.4	83.4
6th grade	70.3	73.1	59.6	66.0	63.0	68.5
9th grade	46.5	52.3	45.2	51.4	65.1	78.1
12th grade	61.6	73.6	48.3	62.2	53.0	63.5

Table 4: Percentage of students that scored a medium or high performance on language, maths and natural sciences tests. National evaluation (2005). For the country and province of Río Negro.

In general, almost two thirds of the total interviewees (61.3%) claimed that they have passed math courses in the previous year without difficulties.<sup>5</sup> This figure is 76.2% for language and literature courses.<sup>6</sup> However, these important groups as a proportion of the total respondents are distributed unevenly among their future career aspirations. In this sense, and similar to evidence available for the OECD countries, those who stated that will follow natural and physical sciences and engineering stand out for their good performance at maths, presenting the highest figures for the option “passing without difficulties”: 72.0% and 67.4%, respectively.<sup>7</sup> However, these two groups of students are exactly those that

<sup>5</sup>This group consist of those students that self-reported that they didn’t need to take summer courses or repeat exams at the end of the year.

<sup>6</sup>The comparison of these proportions with the percentages of individuals presenting medium or high levels of performance in the national evaluation just presented present percentages that are almost identical (62.2% and 73.6%, respectively). This makes us confident about the robustness of our responses. Unfortunately, our survey did not ask about their performance on natural sciences since not every student in the sample took courses on the subject on the field on 11th grade.

<sup>7</sup>In both cases, these proportions are significantly different from the mean at the 1% level.

have the poorest performances in languages (70.0% and 69.9%, respectively). Specifically, the aspirants of architecture and economics are those that present the bigger proportions of individuals that pass this subject without complications. Table 5 presents these results.

<b>Chosen field of study</b>	<b>Passed without difficulties</b>	
	<b>Math</b> (in %)	<b>Language</b> (in %)
Econ. & Business Adm.	62.7	80.0
Medical Scs.	62.5	78.6
Law	55.0	76.7
Human & Social Scs.	57.5	77.5
Engineering	67.4*	69.9
Architecture	55.0	81.0
Education	52.1	77.1
Nat. & Physical Scs.	72.0*	70.0
Total	61.3	76.2

Table 5: Previous performance at maths and language by chosen field of science at the university. Significance levels for the  $\chi^2$  test for independence: \* 10%, \*\* 5%, \*\*\* 1%.

## 4.2 Family background

Río Negro on the whole has a smaller proportion of inhabitants that attended higher education (13.8%) than the national average (15.6%). Since parental background is believed to affect the education decisions (both in terms of level and orientation), we are interested in characterizing the educational background of the parents of those youngsters finishing high school. However, in respect to their parents' education, our respondents indicate that the proportion of parents with education beyond the compulsory post-secondary levels is higher than both the provincial and national averages. Specifically, 37.3% of our interviewees declare that their fathers have attended (either completed or not) post secondary studies. Those who specifically attended university reaches 27% with 16% stating that their fathers obtained an university degree. The percentages are higher for the mothers' case. In this case, 41% have attended tertiary education, with 29% of the total pool were enrolled in university studies. In total 18.1% obtained a degree, and almost one quarter of this group followed postgraduate studies.

Conducted at the same time that our survey, the Labour Survey (EPH) reported for the urban population of the province of Río Negro an unemployment rate of 3.1% for males and 9.0% for females aged between 30 and 64 years. In this respect, when consulted about their parents' employment status, our interviewees indicated that 2.2% of their fathers and 1.6% of their mothers were unemployed. In relation to the household monthly income, the average reported by the interviewees reached AR\$ 4,191 (equivalent to US\$ 1,360 at the time).<sup>8,9</sup>

<sup>8</sup>It should be noted that only 44% of the interviewed individuals provided this information. Also, it is interesting to mention that male interviewees reported household incomes that on average were 40% higher than those reported by the female counterparts.

<sup>9</sup>This average value is less than the one resulting from multiplying by two the average wage obtained by the employees working at the private sector in the province (AR\$ 2,160). Source: EPH, net average wage at the private sector. Information for the third quarter 2008.

### 4.3 Future plans

Traditionally, access to university in the country is equated with social mobility. Two factors have a fundamental importance in this respect: studying has no costs and admissions in most of the cases only require the student to have finished secondary studies with no disciplinary restrictions. Then, at the national level, we observe that a large proportion of those that have finished high school have started university studies (34.5%), this figure rocketing to (63.2%) for the younger population (20 to 30 years old). Similarly, for Río Negro the proportions are 39.6% and 53.6%, respectively.<sup>10</sup>

Then, when the interviewees were asked about their future plans, it is not surprising to find that a large proportion (69.7%) declares that it will continue its studies at the university level. This percentage matches quite well the observed reality at both the provincial and national levels. Those interested in continuing their education at non-university institution reach 10.6%. Interestingly, 11% states that they are undecided about their future plans, while the remaining 7.9% is inclined to enter the labour market without further education. When we analyze further this data, we observe that there are no substantial differences in respect to their future plans with respect with the interviewees' location. Gender though, has an effect on future plans. As might be expected, males present a bigger proportion of individuals declaring their intentions to work right away. On the other hand, and in agreement with the received literature, we find bigger percentages of females both undecided and inclined towards tertiary non-university studies.<sup>11</sup>

	Future plans (%)			
	Tertiary	University	Working	Undecided
<b>a. Gender</b>				
Female	13.0	69.0	6.0	12.0
Male	8.0	71.0	11.0	10.0
<b>b. Father Education level</b>				
Uncomplete primary school	13.0**	59.0	13.0**	15.0
Completed primary school	17.0**	52.0	10.0**	20.0
Uncompleted secondary school	9.0	70.0	7.0	15.0
Complete secondary school	9.0	76.0	10.0	5.0
Uncomplete Tertiary	17.0	67.0	0.0	17.0
Complete Tertiary	7.0	74.0	2.0	14.0
Uncomplete University	14.0	78.0	1.0	7.0
Complete University	1.0	93.0**	3.0	3.0
Postgraduate studies	6.0	94.0**	0.0	0.0
Total	11.0	70.0	8.0	11.0

Table 6: Interviewees' future plans by gender and parental education. On percentages. Significance levels for the  $\chi^2$  test for independence: \* 10%, \*\* 5%, \*\*\* 1%.

We should mention that the decision to attend university is the preferred option for the interviewed youngsters no matter their parents education level (Table 6). As expected, those individuals whose fathers completed university studies, are almost unanimously inclined to

<sup>10</sup>Nevertheless, previous studies show that the population that attends university are, generally speaking, those belonging to more privileged backgrounds. Unfortunately, these studies only provide partial pictures since there is no updated university censuses or nationwide surveys oriented towards producing such characterization.

<sup>11</sup>Both differences are significant at the 5% level.

reach the same level of education, as expected in the literature about intergenerational mobility.<sup>12</sup> Those whose fathers attended but didn't obtain their university diploma are closely behind these previously mentioned levels. Additionally, the individuals coming from low-education backgrounds are primarily inclined to attend university, reaching similar levels of interest (59% and 52.2%) to the total percentage.<sup>13</sup> Evidently, personal plans are heavily influenced by the dominant perception about prerequisites for individual success and existing opportunities.<sup>14</sup>

## 5 Attractive careers

As mentioned elsewhere, the main driver for this study is understanding the reasons behind the concentration of university students in a few careers. Despite its importance, only very few studies have focused on studying the factors influencing this decision or the perception that youngsters have about the different options.<sup>15</sup> Understanding such a complex phenomenon requires collecting information that is not currently available and require a self designed study that will represent the young population of the country. In this respect, a fundamental issue that we asked our interviewees was to name two careers that they considered attractive. Taking into account the national classifications we observe that the distribution of answers by broad group of disciplines obtained in the Province of Río Negro are almost identical to the one observed for new enrollments at the national system (Table 7). Again, we are confident that the results and evidence presented here can be extrapolated easily to the country as a whole.

<b>Broad groups</b>	<b>Survey</b> ( %)	<b>New enrollments</b> (%)
Health sciences	10.9	12.9
Applied & Basic sciences	26.7	29.9
Humanities & Social sciences	62.4	57.2
Total	100.0	100.0

Table 7: Distribution of new enrollments in the university system and of interviewees' responses about the most attractive careers. Own elaboration using survey results and University Statistical Yearbook( 2007).

Respondents were asked to name two careers considered the most attractive. Using this information we observe that the list of most attractive careers presents a combination of "traditional" careers (i.e., medicine, law, psychology and accountancy) with others recently highlighted in both the political and academic discourses (such as engineering and infor-

<sup>12</sup>The higher percentages are statistically different from the average at the 5% level.

<sup>13</sup>In this cases, the shares of individuals inclining towards tertiary education and entering the job market are statistically different from the average at the 5% level.

<sup>14</sup>It is worth mentioning that when we asked the interviewed individuals to indicate in terms of relevance different factors that might be considered drivers or individual success, two main factors stand as the most important determinants: chosen profession and attending university. Also, and providing some indications that the individuals believe that specific occupations provide access to specific rewards, the professional orientation is considered even more important than the individual ability. At the same time, the expectations about social mobility and a meritocratic society are palpable when we observed that neither social origin nor access to contacts are considered determinant of the individual performance.

<sup>15</sup>Two endeavors aiming at addressing this issue are the Second Argentinean Survey of Perception for Science and Technology (2007) and the just finished studies about the Science as a Career in teenager population (2009).

matics).<sup>16</sup> Nevertheless, those that belong to the first group lead the ranking in terms of mentions, concentrating an important percentage of the intentions. Table 8 presents the list of the ten most attractive careers which concentrated 47.2% of the choices. Priority careers only account for 13.7% of the intentions from the most preferred careers

Order	Career	Number of mentions	Percentage
1	Medicine	104	8.0
2	Law	88	6.9
3	Psychology	83	6.4
4	Accountant	64	4.9
5	Architecture	57	4.4
6	Business Administration	47	3.6
7	Tourism administration	43	3.3
8	Mechanical Engineering	43	3.3
9	Physical Education	42	3.2
10	Informatics	41	3.2
<b>Most attractive careers by type</b>		<b>Mentions</b>	<b>Share</b>
Priority		84	13.7
Non priority		528	86.2

Table 8: List of more attractive careers and its distribution by type of career.

It is worth mentioning that traditional careers are among the most attractive for the individuals from both genders. In Table 9 we can see that the list of most preferred careers in the case of male interviewees includes a higher proportion of technical disciplines (such as informatics, mechanical, electronic and civil engineering), being the first two careers leading the ranking. In terms of shares, priority careers represent 21.1% of the most preferred careers. In the case of females, their inclination towards traditional careers and those in the social and humanities fields is clear. There, we observe that the priority careers are completely absent from the list of the most preferred disciplines.

## 5.1 Influences in the decision

When confronted with the decision about whether to continue studying and what to study, youngsters are presumed to compile and process numerous sources of informations, while taking into account suggestions from teachers, friends, counselors and family members. It is this combination of information and personal experiences that shapes the individuals perceptions about the cost, opportunities and expected advantages of different options. Resulting from this particular set of information, a decision is made.

In the literature on career development, parents and other family members are among the most important influences, sometimes the most important (Grubb, 2002). Sometimes these influences are beneficial, for example when sophisticated parents can provide their children with perspectives on a wide variety of employment and on educational prerequisites, and when their own lives provide models. In other cases, the influences are surely negative in the sense of constraining the options to which a child can aspire.<sup>17</sup> In other cases parents

<sup>16</sup>Below we present a classification of the different careers in two groups: priority or not priority careers. This distinction follows official documents from the Argentinean authorities. Section 7 presents more information on this matter.

<sup>17</sup>Constraints on aspirations occur in both high-status families for example, when fathers pressure their sons to follow in their footsteps and in low-status families, for example when parents pressure their children



Males			Females		
	Career	%		Career	%
1	Informatics	7.1	1	Medicine	9.7
2	Mechanical eng.	6.9	2	Psychology	8.9
3	Medicine	5.5	3	Law	8.2
4	Architecture	5.3	4	Accountant	5.8
5	Law	4.8	5	Tourism adm.	4.3
6	Electronic eng.	3.9	6	Business adm.	4.0
7	Accountant	3.7	7	Architecture	3.6
8	Physical ed.	3.4	8	Physical ed.	3.0
9	Psychology	3.2	9	Education	2.2
10	Civil eng.	3.2	10	Journalism	1.8
<b>By type</b>		<b>Share</b>	<b>By type</b>		<b>Share</b>
Priority		21.1	Priority		0.0
Non priority		78.9	Non priority		100.0

Table 9: List of more attractive professions by interviewees’ gender and type of careers.

lack the knowledge that might benefit their children.

**Suggestions and parents’ recommendations** In this latter aspect, we asked the interviewees to indicate their parents (both mother and father) preferred career and whether they have received or not some suggestion from teachers. As Table 10 shows there are strong similarities between the most frequently received suggestions by their parents and professors. More interestingly for our purposes, we observe that these suggestions are also quite similar to the interviewees’ preferences presented just before.

Order	Suggested by parents	Suggested by teachers
1	Law	Accountant
2	Medicine	Law
3	Engineering	Medicine
4	Accountant	Engineering
5	Architecture	Tourism administration
6	Psychology	Psychology
7	Informatics	Informatics
8	Physical Education	Mechanical Engineering
9	Foreign trade	Physical Education
10	Business Administration	Business Administration

Table 10: List of 10 most suggested careers by Parents and Teachers. On percentages and cumulated percentages.

Again, careers like Law, Accountancy, Medicine and Psychology are frequently mentioned. It is interesting to mention that the suggestions received from either mothers or fathers are strongly similar. In fact, the first six suggestions are identical and concentrate almost 70% and 68% of the total mentions, respectively (Table 11). This together with

to remain in their culture of birth.

what was mentioned about the professors’ suggestions give us room to think that there is an important social consensus about what careers should be followed.

Suggestions from fathers			Suggestions from mothers		
No.	Career	%	No.	Career	%
1	Law	18.0	1	Law	18.0
2	Medicine	13.6	2	Medicine	16.9
3	Engineering	11.2	3	Engineering	7.9
4	Accountant	7.6	4	Accountant	5.8
5	Architecture	4.8	5	Architecture	4.7
6	Psychology	4.0	6	Psychology	3.6
7	Informatics	2.8	7	Physical ed.	3.2
8	Civil engineering	2.8	8	Business admin.	2.9
9	Veterinary	2.4	9	Tourism	2.5
10	Oil engineering	2.4	10	Informatics	2.5
By type		Share	By type		Share
Priority		16.4	Priority		10.4
Non priority		83.6	Non priority		89.6

Table 11: List of 10 most suggested careers by fathers and mothers and by type of career.

Again, while the most traditional careers lead the list of suggestions received, males tend to receive more suggestions oriented towards technical fields. In fact, four different engineering specializations and informatics are included among the ten most mentioned. In the case of females, the suggestions received match perfectly the distribution of new enrollments at the university level as a whole. Instead of such an emphasis on engineering, there is a recurrent suggestion to go for traditional careers, psychology and education related fields.

One interesting aspect to analyze is whether the individuals parents suggest to follow the same fields of study that they have or not. In this respect, we observe that those parents who have followed university studies in oriented towards applied or exact sciences are particularly those who are more keen about their offspring being enrolled in the same type of career (see Section 7). Here, even when previous generations trained in these technical fields would orient and suggest younger aspirants to enroll in these careers, the small proportion of parents’ specialized in these fields implies an information barrier that shows difficult to overcome. This is more evident when we classify the careers in either priority or non-priority fields.

**Coincidence with other’s opinions** As we mentioned previously, there is a strong coincidence between the list of careers that the interviewees consider as attractive and the list of recommendations and preferences by teachers and parents. At the aggregate level, the choices of our respondents are equivalent to their mother preferences on 69.8% of the cases, 67.1% for their fathers and 61.2% for those who received suggestions by teachers. When we analyze further this information by careers, we observe that the maximum level of coincidence with the mothers’ opinion is with Law studies (being this percentage significant at the 1% level), while in the case of fathers’ suggestions the higher similarities are found on engineering and medical sciences (both significant at the 1% level). At the same time, teachers suggestions have important level of coincidence for economics and engineering. Natural and Exact sciences and Informatics present small levels of agreement with either

parents or professors preferences and suggestions, without reaching 50% in any of the cases. This, again, is a dimension that should be taken into account when exploring the occupation choice. The following table summarizes these results.

<b>Field of Science</b>	<b>Level of agreement with</b>		
	<b>mothers</b>	<b>fathers</b>	<b>teachers</b>
Econ. & Business Adm.	72.7	72.2	74.5***
Medical Scs.	76.3	83.6***	49.1
Law	84.6*	63.6	69.2
Human & Social Scs.	53.2	42.6	56.9
Engineering	72.1	89.6***	69.3***
Architecture	78.9	76.2	63.0
Education	66.7	29.4	50.0
Nat. & Physical Scs.	50.0	46.7	42.9
Total	69.8	67.1	61.2

Table 12: Degree of agreement with parents' preferences and teacher's recommendations. On percentages. Significance levels for the  $\chi^2$  test for independence: \* 10%, \*\* 5%, \*\*\* 1%.

## 6 Perspectives about different careers

University careers present an interesting feature: we all know professionals from different specializations but, nevertheless, very few people would be able to know exactly the income or the main characteristics of the jobs of many professions.<sup>18</sup> Necessarily, we all build perceptions about them. In most of the cases, these perceptions or incomplete information guide the decisions about what to choose. This section is exactly about this: the perceptions that individuals have about different careers.

There is a widely held perception that Science, Engineering and Technical (SE&T) careers are very unattractive and hold little appeal for young people. This perception covers remuneration, career structure, work environment, status and marketing (Europe needs more scientists, 2004). This tendency exists despite some important characteristics of such careers. First, remuneration of SET workers is in the upper quartile of professions. Second, unemployment amongst holders of SET tertiary education qualifications is lower than that of the population at large. Third, the diversity of careers for people with an S&ET background is shown to be great and probably far more varied than in any other sector. It seems we have reason to believe that industry and the profession are not selling careers in S&ET in the most attractive fashion.

In this setting, we believe it is fundamental to understand the perception that prospective students have about these disciplines, their expectations about the future. Thus, we asked our interviewed individuals to provide their opinions about income, individual respect, social value and labor market demand for the most demanded fields. The eleven careers presented in the survey concentrates 67.3% of the total enrollments at the university system in 2007 and presented a rate of growth in their enrollments that reaches 17.4%, just below the 21.0% exhibited by the system as a whole. Table 13 summarizes their shares over the total careers in terms of new enrollments, students and graduates.

<sup>18</sup>Otherwise, if we were fully capable, the new emphasis put on the provision of information as a guidance policy at the OCDE and EU levels would not make sense.

<b>Career</b>	<b>New enrollments</b>	<b>Students</b>	<b>Graduates</b>
Economics, B.A & C.P.A	17.3	19.7	17.1
Medicine and related	11.0	11.6	16.9
Law	10.2	13.1	14.3
Engineering	6.4	6.1	5.8
Architecture & Design	5.4	6.0	5.7
Informatics	4.9	4.3	2.2
Psychology	4.8	4.6	4.8
Communication	3.8	3.8	2.8
Sociology	3.5	3.2	3.2
Total	63.3	72.4	72.8

Table 13: New enrollments, students and graduates for selected university disciplines. On percentage of total figures for the university system. Source: SPU Statistical Yearbook (2007)

## 6.1 Income

The first dimension that we asked about the list of most frequently demanded careers is income for a graduate.<sup>19</sup> It seems plausible to expect that high income makes a career attractive (section 5). When consulted, the interviewees indicated architecture, engineering, medicine and law as the careers with the highest wages. Interestingly, and in strong contradiction with every statistical evidence, informatics is listed among the careers with the lowest income, slightly over physics.

<b>Professions</b>	<b>Believed monthly income</b>	
	Argentinean pesos	Rank
Architecture	4,770	1
Business Administration	3,375	5
Communication	2,386	10
Design	2,844	6
Engineering	4,616	2
Informatics	2,446	8
Law	3,899	4
Medicine	4,421	3
Physics	2,360	11
Psychology	2,828	7
Sociology	2,399	9

Table 14: Respondent's believed monthly income for graduates from a list of selected careers. Expressed in Argentinean pesos and ranking.

<sup>19</sup>The literature agrees that expectations about more distant periods become more difficult for young individuals. Then, we inclined to obtain information about a recently graduated professional. We realize that the income profile are certainly different across time and we are not able to control for this fact.

## 6.2 Social reputation and individual consideration

Interested in understanding the role that “social rewards” might play in occupation choice, we asked our interviewees to indicate using a 5-point scale how much they respect and how much they believe society values each of the professionals listed. In relation to their own opinions about social consideration, medicine, law and engineering occupy the first places. Medicine and engineering are on the top of the rankings in terms of individual respect, followed by architecture and law. It should be noted that the careers in the field of applied sciences such as architecture and engineering are well respected personally but believed to be more punished socially. Design and physics show an important difference between personal and social rankings but are still considered quite poorly.

<b>Professions</b>	<b>Social Perception</b>		<b>Individual Perception</b>	
	5-point scale	Rank	5-point scale	Rank
Architecture	3.99	3	3.79	4
Business Administration	3.60	7	3.73	5
Communication	3.22	10	3.02	8
Design	3.15	11	2.80	11
Engineering	4.37	2	3.94	3
Informatics	3.98	4	3.52	6
Law	3.73	5	3.98	2
Medicine	4.46	1	4.38	1
Physics	3.62	6	2.85	10
Psychology	3.56	8	3.30	7
Sociology	3.30	9	2.92	9

Table 15: Social and individual perception of a list of careers on a 5 point scale where 1 stands for very low and 5 for very high and rankings.

## 6.3 Demand in the labour market

In respect of the respondents’ opinions about the careers with the highest demand for their graduates, the list is lead by engineering, law and informatics. While the first two careers were included among those with the highest expect incomes and better standing in both social reputation and individual respect, informatics is an interesting case. This career, focus of multiple specific studies, even when is perceived as career with an important demand, its wages are believed to be relatively lower. This, combined with the bad performance in terms of social rewards might explain the reasons between the recent incapacity to attract enough individuals to satisfy the rampant demand expressed by the growing number of companies in the country.

## 6.4 Synthesis

With the intention of providing a summary of the considered dimensions, Table 17 presents the relative position for each of the professions listed in comparison with the average for each of dimension. Hence, a (+) indicates that the career presents an average that exceeds the aggregate average, while (-) refers to the opposite situation.

There, we can observe different situations. Careers such as law, medicine and engineering present positive values for every dimension. While the evidence about university

<b>Professions</b>	<b>High Labour demand</b>	
	on %	Rank
Architecture	17.9	7
Business Administration	33.6	5
Communication	5.6	11
Design	5.9	9
Engineering	59.2	2
Informatics	39.3	4
Medicine	60.6	1
Law	44.3	3
Physics	18.8	6
Psychology	9.7	8
Sociology	5.6	10

Table 16: Demand of the graduates from a list of careers on percentage and rankings.

enrollments seems to reflect opinions about law and medicine, the opinions about engineering and its characteristics do not seem to be reflected in enrollments. Careers such as sociology, psychology, communication and designs specialisations pose similar questions. However, in these cases the incongruence is patent since all of these careers obtained negative values for every dimension while the enrollments figures show a traditionally high level of new enrollments for the first three cases and a rocketing performance in the case of the different designs specialisations. Architecture only receives a negative assessment in relation to the labor demand, while business administration obtained half positive and half negative scores. Physics, as an example of natural and physical sciences, only obtained negative values.

<b>Professions</b>	<b>Believed Income</b>	<b>Social Perception</b>	<b>Individual Perception</b>	<b>Labour demand</b>
Architecture	+	+	+	-
Business Administration	-	-	+	+
Communication	-	-	-	-
Design	-	-	-	-
Engineering	+	+	+	+
Informatics	-	+	-	+
Law	+	+	+	+
Medicine	+	+	+	+
Psychology	-	-	-	-
Physics	-	-	-	-
Sociology	-	-	-	-

Table 17: Summary of characteristics for a list of careers.

Taking this as a starting point, Table 18 presents the information about the share of enrollments and its rate of variation in the last decade for the different groups formed by the type of assessment offered by our interviewees. Generally speaking, the group that receives the positive assessment not only presents an important share of the new enrollments but presented an evolution that was higher than the one presented by the system as a whole. The second group can be characterized by presenting a large share of the present enrollments

but a slower growing trend than the one experienced by total enrollments. Even the career that presents the most dynamic performance of those in these group –informatics- exhibits a rate than only reaches half of the average change. Finally, the bottom group concentrates a relatively smaller group but with important growth rates. Specifically, these rates are fostered by the rocketing behavior of both psychology and sociology. Recently newly established careers –such as those in design- represent an important share but not such a dynamic behavior. While physics stands out for its almost negligible level, communication is the only career presenting a negative trend in the last decade.

<b>Professions by group</b>	<b>Share (%)</b> (2007)	<b>Growth rate (%)</b> (1997-2007)
<b>Positive assessment</b>	<b>29.3</b>	<b>24.9</b>
Law	13.5	10.2
Medicine & paramedics	10.4	42.5
Engineering	5.4	10.1
<b>Mixed assessment</b>	<b>25.6</b>	<b>6.6</b>
Business Administration	17.6	3.5
Informatics	5.4	10.1
Architecture	2.6	3.6
<b>Negative assessment</b>	<b>14.7</b>	<b>24.6</b>
Psychology	4.8	30.0
Sociology	3.6	121.7
Communication	3.1	-15.1
Design	3.0	12.5
Physics	0.2	10.1
All	100.0	21.0

Table 18: New enrollments, share and rate of variation for a list of selected careers by assessment group. In percentages.

## 7 Priority fields

Distribution of students, new enrollments and graduates are biased against the natural and physical sciences, those careers related with software and informatics and, to a lesser extent, engineering. With the intention of promoting those areas considered strategic for the development and growth of the economy, at the beginning of the decade the Argentine federal government established several sectoral fora. One of the most recurrent restriction presented in these fora was the lack of suitable human resources in technical areas and for specific industry needs. The list of these required professions forms what the Ministry of Education called “Priority fields”.

Today, the federal government has several initiatives –Bicentenary Scholarships, ICT Scholarships, IT Generation and Control+F– oriented towards promoting the enrollment and graduation in ST&E disciplines. Centered on offering financial means, these schemes do not try to modify issues related with the youngsters’ vocation or the image that the different careers present. Trying to understand the factors behind the decision of a priority field as the chosen career, this section offers a characterization of the respondents inclined forward these fields.

## 7.1 Priority fields: characterization of prospective students

Students who state the intention to enroll in these “priority fields” represent a 20.5% of the total interviewees and 21.2% of those planning to continue their studies at the university. This group can be characterized as conformed predominantly by males students (72.6%), educated in public schools (73.1%) who followed a technical orientation or track at their secondary schools (65.5%). In all these respects students in priority fields are statistically different to their counterparts on non priority areas. Table 19 presents a complete characterization of the prospective university students by type of career they will follow.

	Students by type of career		
	Non priority	Priority	Total
<b>a. Gender***</b>			
Male	33.4	72.6	44.7
Female	66.6	27.4	55.3
<b>b. Type of school**</b>			
Public school	63.9	73.1	66.6
Private school	36.1	26.9	33.4
<b>c. Secondary school track***</b>			
Non technical education	74.8	34.5	63.0
Technical education	25.2	65.5	37.0
<b>d. Performance on secondary school</b>			
Percentage of higher performance on Maths**	62.9	73.4	65.8
Percentage of higher performance on Language	80.1	74.6	78.6
<b>e. Assessment about the secondary school characteristics</b>			
Percentage w/ good assessment about quality**	34.5	24.8	31.7
Percentage w/ good assessment about its academic aspects	28.0	27.4	27.8
Percentage w/ good assessment about infrastructure	9.2	9.6	9.3
Percentage w/ good assessment about career information	9.9	8.3	9.4
<b>f. Family background</b>			
Mothers with tertiary education	52.5	48.3	51.3
Fathers with tertiary education	44.9	37.6	42.8
Mother's in priority fields*	7.3	14.1	9.2
Father's in priority fields*	24.1	38.3	27.7
Older siblings in priority fields	21.2	16.7	19.8
Monthly family income	4,253	4,396	4,295
<b>g. Self-assessment about readiness for university studies</b>			
Higher level of preparation	8.4	6.3	7.8
High likelihood of finishing H.E. studies	58.3	53.2	56.8

Table 19: Main characteristics of the respondents who decided to follow university studies by type of career they choose. In percentages. Significance levels for the  $\chi^2$  test for independence or two independent sample t-test: \* 10%, \*\* 5%, \*\*\* 1%.

As Table 19.d shows, those students who decided to enroll in priority fields exhibit a significantly bigger proportion of students in the top tier of performance in maths (this difference being significant at the 1% level) in comparison to those in non-priority fields. By contrast, the performance of the two groups of students is similar in reference to language. In relation to the individuals' opinion about their secondary school, their quality and characteristics, the students aiming to enroll in priority fields results more demanding than their counterparts in non-priority fields. Generally, they tend to be more critical about the school quality (this difference being significant at the 5% level). This behavior is



also observed in relation to the services related with the career counseling and information, although the differences are not statistically significant. We should stress that this latter aspect is, together with the infrastructure,<sup>20</sup> the dimension presenting the worst evaluation by the whole pool of interviewees. In addition, they seem to be identically satisfied with the academic aspects such as the content of the classes, the type of evaluation and the pedagogical devices and means applied. These evidences allow us to question whether the school system is providing the necessary means and knowledge to induce students to opt for SET careers (see Table 19.e).

The comparison of the two groups of students in terms of their family background, shows that students following a priority field present a smaller proportion of parents with tertiary education. Nevertheless, they exhibit a higher share of tertiary educated parents (both mothers and fathers) trained in priority fields at the post-secondary levels. In both cases these differences are significant at the 5% level. The comparison between groups in relation to the family monthly income almost doesn't show differences. For details see Table 19.f.

Again, the major level of criticism expressed by the aspirants to priority fields is exhibited in their self-assessment about the level of preparation and the likelihood of finishing their university studies (Table 19.g).<sup>21</sup> Despite not presenting statistically significant differences, our focus group stress their lack of confidence arising from a poor evaluation of their skills and preparation provided by the educational system.

## 7.2 Different choices: different expectations

This section presents the differences in perceptions about pecuniary and non pecuniary rewards and opportunities. When asked about the characteristics that they believe their careers have in terms of income, social rewards and labor demand, those enrolled in priority fields express more optimistic perceptions than their counterparts. Specifically, they expect to obtain an income that 43.8% higher than the average of the graduates from non-priority fields, reaching an income 23% higher than the one declared as the household monthly income. Hence, priority careers are perceived as a potential source of improvement and upward mobility. The aspirants to non-priority fields, on the contrary, expect lower wages than their declared household income.<sup>22</sup> While there are no differences in relation to social perception there are significant differences in the way each group considers the professionals of their own fields. Finally, those inclined for priority fields are more likely to indicate that their career is among the most demanded, this being expressed in 72% of the cases. Table 20 presents this information.

At the same time, the aspirants to priority fields are more inclined to consider themselves as prepared to perform a variety of occupations. Those interested in non-priority fields believe, instead, that the skills they will obtain during their studies will allow them to work in one occupation only. The important flexibility believed to characterize priority fields allow us to believe that these areas are a shelter for unemployment. Table 20.b compares the expectations for the two different groups of individuals.

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<sup>20</sup>Students were consulted about their opinion about the availability of science labs, audiovisual teaching facilities and the state of maintenance

<sup>21</sup>The interviewees were asked to self-report their level of preparation for their university studies and their opinion about how likely it was for them to finish these studies.

<sup>22</sup>It is interesting to note that this difference between the groups is observed even after controlling for the respondents' parents level of education.

	Students type of career		
	Non priority	Priority	Total
<b>a. Expected rewards</b>			
Believed income***	3,768	5,419	4,258
High demand***	40.0	71.9	49.3
Social value***	4.4	4.6	4.5
Individual perception	3.7	3.7	3.7
<b>b. Expect to obtain skills useful for...</b>			
Only one occupation**	20.8	13.0	18.5
Various occupations***	54.3	65.9	57.7
For every occupation	24.9	21.1	23.8

Table 20: Expectations about income, social rewards and labour market performance of those respondents who decided to follow university studies type of career they choose. In percentages. Significance levels for the two independent samples t- test: \* 10%, \*\* 5%, \*\*\* 1%.

## 8 Econometric analysis

Our interest resides in being able to identify factors that have an influence (and to what extent) in the election of a priority field. With this intention in mind, we will characterize the election choice as a sequential process (see Hossler et al. (1989) for details). Hence, the individual should decide first, whether she will continue studying at the university or not. Only those who would follow this stage, will be capable of choosing for a priority field.<sup>23</sup>

As a strategy to explain the decision to enroll in priority career we applied a binomial probit with sample selection model (Van den Ven and Van Praag, 1981). Specifically this model consists of a sequence of two probit models linked by correlated errors, the first stage being a selection equation that determines the likelihood of continuing to attend the university and the second (outcome equation) the likelihood of choosing a priority carrier ( $y = 1$ ) or not.

The model assumes that there is an underlying relation (latent equation)

$$y_j^* = x_j\beta + u_{1j}$$

such that we observe only the binary outcome (outcome equation)

$$y_j^{outcome} = (y_j^* > 0).$$

The dependent variable is, however, not always observed. Instead, the dependent variable for observation  $j$  is observed if:

$$y_j^{selection} = (z_j\gamma + u_{2j} > 0)$$

where

$$\begin{aligned} u_1 &\sim N(0, 1) \\ u_2 &\sim N(0, 1) \\ corr(u_1, u_2) &= \rho \end{aligned}$$

<sup>23</sup>As becomes evident, this is a stylized depiction of the process. Naturally, the expectations of rewards likely to be obtained at different fields will be compared and used for deciding whether to study at the university or not.

Here, we are aware that there is a possible correlation ( $\rho$ ) between the errors of the two equations. If that correlation is nonzero, estimates of the selection equation will be biased unless we account for the selection. In this type of model we explicitly consider that the factors influencing the selection and those the outcome are different to successfully identify the model. By doing this, we are saying that a different set of variables and coefficients determine the probability of censoring (selection equation) and the value of the dependent variable given that it is observed. These variables may overlap, to a point, or may be completely different.

Hence, we have three possible outcomes:

1. No university
2. University-non priority
3. University-priority

Taking this as a starting point our strategy consists on estimating the probability of an individual choosing a priority career given that she has already indicated her intention to attend university. Here, we will proceed in a sequential fashion. First, we will present the results by considering in the outcome equation individual variables (such as gender, age, educational track, type of school that attended, performance at school) and family background factors (parents' education specialization, family income) together with variables related with expectations and perceptions about the chosen career (expected income, labor demand, social value and reputation) individually. This will permit us to show their relevance and influence in the choice decision. Finally, and as a second stage, we will present different combinations of these rewards (income and social value and, finally, the income, social value and demand). In each of these two stages we will use the same explanatory factors in the selection equation, being the reader get more information about this at Appendix B.<sup>24</sup>

**Stage 1: Individual factors, family background and expectations** This first stage of the estimation strategy present different analysis where each of the four different expectations were included as an explanatory factor: expected income, labor demand, social value and individual consideration (Models 1, 2, 3 and 4 shown on Table 21, respectively) .

We find for each of the specifications considered here that, once individuals decided to continue their studies at the university (i.e., selection =1), educational performance and family background are fundamental factors influencing the decision about what type of career to follow. Specifically, those individuals with better performance at maths and those that followed a technical track in their secondary education, are more likely to opt for priority fields. At the same time, women are less likely to follow priority fields. It is worth noticing that family income, except when believed income is considered, doesn't affect the probability of enrolling in a priority field. Its influence is limited to the selection equation, only (see Annex C).

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<sup>24</sup>Generally speaking, the probability of deciding to enroll on university studies is positively affected by presenting a higher performance on maths and language (each subject individually), have attended a private school and to have followed a technical orientation on the secondary level. In terms of family background, household income positively influences this probability, the same with having a mother that attended high education. Older age negatively affects the decision to continue with university studies. Both gender and the education attained by both parents do not play a role in this decision.

Personal, Family factors and Perceptions about careers						
	Model 1		Model 2		Model 3	
	Results	Marginal effects for outcome/selection=1	Results	Marginal effects for outcome/selection=1	Results	Marginal effects for outcome/selection=1
<i>Outcome equation</i>						
Gender	-0.456 (0.118)***	-0.315	-0.758 (0.180)***	-0.238	-0.873 (0.177)***	-0.908 (0.168)***
Age	0.268 (0.091)***	0.071	-0.032 (0.098)		-0.046 (0.093)	0.169 (0.089)
Technical track	0.276 (0.091)	0.401	0.755 (0.188)***	0.205	0.736 (0.186)***	0.703 (0.176)***
Private education	-0.172 (0.118)		0.118 (0.209)		0.107 (0.205)	0.062 (0.193)
Maths performance	0.076 (0.017)***	0.139	0.352 (0.198)*	0.078	0.374 (0.192)*	0.325 (0.178)*
Language Performance	-0.230 (0.234)		0.226 (0.223)		0.296 (0.217)	0.252 (0.203)
Family income	-0.035 (0.018)**		0.009 (0.019)		0.009 (0.018)	-0.009 (0.017)
Priority father	-0.187 (0.147)		0.131 (0.296)		-0.011 (0.280)	0.013 (0.278)
Priority mother	0.494 (0.385)		0.199 (0.416)		0.282 (0.399)	0.172 (0.379)
Expected income	0.037 (0.214)*	0.022				
Demand			0.711 (0.174)***	0.231		
Social Value					0.337 (0.170)**	0.116 (0.044)
Individual respect						0.183 (0.183)
Test Independence	0.02**		0.115		0.176	0.080*
Prob LR	***	***	***	***	***	***
<i>n</i>	289	340	334	363		

Table 21: Sign and significance levels for the explanatory factors of the probability of choosing a priority field including expected income(Stage 2). Robust standard errors in parentheses. Significance: \* 10%, \*\* 5%, \*\*\* 1%. Marginal effects are presented for significant factors only.

In relation to the possible dimensions related to rewards and perceptions, we find that the higher the expected income expected (Model 1), the more demand in the labor market is perceived (Model 2) and the higher the value that the individuals considers society attaches to these professionals (Model 3) more likely is that our respondents will incline towards ST&E fields. Differently, individual respect (Model 4) doesn't have a significant effect on the decision of what field to follow.<sup>25</sup> Concluding, we have grounds to believe that those initiatives aimed at promoting higher levels of enrollment in ST&E disciplines require including information that stresses the importance and potential contributions that these professionals might have for society. Of course, accurate and update provision of information that will highlight the excess demand and higher wage levels of these professionals will certainly help to surmount the current bottlenecks.

**Stage 2: Combining expectations: the role of non-pecuniary rewards** As the second stage of our analysis we present estimations that go beyond of the validity of using the expectations as explanatory factors. Here, we present estimations that try to reproduce, as much as possible, the decision that the individuals are confronted with. After deciding to attend university, the young individuals have to “mix” information and expectations about the different characteristics that the existing alternatives present. To make our point clearer, we present two successive estimations that will combine expectations about different rewards.<sup>26</sup> On the first case, we will include as explanatory factors both the expected income and the opinion about the social value. As the final step we add the perceptions about labor demand.

Model 1 (Table 22) presents the results for the analysis that includes as explanatory factors both the expected income and the social value. Combining these perceptions brings some new results. The most important is that in the presence of non-pecuniary rewards as an explanatory factor, the income expectations becomes statistically insignificant. Here, a higher perception of social value increases the probability of choosing a priority field. At the same time, participation in technical a track at the secondary education only affects the choice of field given that the selection equation is observed. It should be noted also that performance in maths loses its explanatory power in the presence of a combination of pecuniary and non-pecuniary rewards. In the same line that the results presented in the second stage, we find that females are less likely to choose a priority fields.<sup>27</sup>

The final analysis presented by Model 2 (Table 22) includes as explanatory factors the all three —expected income, social value, labor demand— perceptions that resulted significant at the Second Stage of our analysis (see Table 30 on Annex C for the complete results). Here, and confirming the results just presented, we find that higher values of social value and an belief in the higher demand of the chosen career increases the probability of enrolling in a priority field. Again, in the presence of these rewards, the expected income becomes an insignificant factor for the decision under study. Again, females are less likely to opt for ST&E disciplines, while have attended a technical track influence the choice given that

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<sup>25</sup>Tables 25, 26, 27 and 28 on Annex C present the complete results for both the outcome and selection equations for each of the models presented here. The interested reader will find there also marginal effects for reaching a positive outcome, for obtaining a positive outcome given that the selection equation is observed and marginal effects for the different factors included in the selection equation.

<sup>26</sup>Taking into consideration the results obtained on the previous stage, we don't include as an explanatory factor the interviewees' opinion about individual respect.

<sup>27</sup>The complete results for both selection and outcome equations are presented in Table 29 on the Annex C.

Personal, Family factors and Perceptions about careers			
	Model 1		Model 2
	Results	Marginal effects for outcome/selection=1	Results Marginal effects for outcome/selection=1
<i>Outcome equation</i>			
Gender	-0.516 (0.215)**	-0.346	-0.521 (0.196)***
Age	0.264 (0.111)**		0.298 (0.103)
Technical track	0.227 (0.029)***	0.376	0.232 (0.021)***
Private education	-0.180 (0.232)		-0.151 (0.139)
Maths performance	0.044 (0.213)		-0.054 (0.138)
Language Performance	-0.308 (0.257)		-0.275 (0.266)
Family income	-0.041 (0.020)**		-0.039 (0.018)***
Priority father	-0.262 (0.369)		-0.317 (0.356)
Priority mother	0.518 (0.481)		0.598 (0.363)*
Expected income	0.034 (0.029)		0.044 (0.030)
Social Value	0.465 (0.187)**	0.275	0.421 (0.184)**
Demand			0.506 (0.165)***
Test Independence	0.009***		0.020**
Prob LR		***	***
<i>n</i>		284	283

Table 22: Sign and significance levels for the explanatory factors of the probability of choosing a priority field including opinions about individual respect (stage 3). Robust standard errors in parentheses. Significance: \* 10%, \*\* 5%, \*\*\* 1%. Marginal effects are presented for significant factors only.

the selection equation is observed. Interestingly, mother’s education (both in terms of level and specialization) seems to positively affect choosing a priority field. At the same time, monthly family income proves to negatively affect selecting a priority field.

With this analysis we have shown that occupation choice is a complex phenomenon that goes well beyond concerns about future wages. Here, individual characteristics, perceptions and family background all have an influence. Specifically, and using expectations about pecuniary rewards, labor demand and non-pecuniary rewards, we show that is the combination of these different dimensions —together with family background and individuals characteristics— what drives the occupation choice and, eventually, the enrollment evolution.

## 9 Conclusions

Despite the importance that student choice has a policy issue, the factors influencing the individuals decisions have not been fully understood. This gap has become specially important in the light of the increasing importance attached to science and engineering university graduates. At the same time, evidence suggests that the provision of additional scholarships for science and engineering students or abolishing the tuition fees will have practically no impact. The major problem seems to be that science and engineering programs suffer from a poor image.

The present study contributed to our understanding of the student choice process, by focusing in the reality of developing country and its problems attracting the brightest minds to the more priority fields. Specifically, we included factors not generally taken into account, allowing us to pay special attention to the role that expectations about the different sources of rewards (both pecuniary and non-pecuniary). Taking in consideration the lack of information, we designed and conducted a survey oriented to characterize the perceptions and expectations held by young individuals finishing high school in Argentina.

Taking into account their future university plans we constructed two different groups (prospective students of priority and non-priority fields) of individuals. This allowed us to show that individuals’ perceptions are different for individuals deciding a career in one field or the other. Specifically, they hope to obtain higher wages, believe that their careers enjoy a higher social value and are more confident about the ease of obtaining a job after graduating in relation to their counterparts in non-priority fields. Interestingly, those in priority fields expect to obtain incomes that are significantly higher than those received by their parents. Using the same classification of individuals, we highlighted the existing differences in terms of educational performance, their more critical assessment of the secondary schools they have attended and an understanding of a more specific range of action once graduated.

Specifically, and by means of a probit model with selection, we showed that the expectations build about future wages (when presented together with other factors as demand and non-pecuniary rewards) don’t have an influence on the orientation of the students. Differently, social value and demand (either included alone or together) positively influence decisions towards SET careers. These results are robust to different specifications of the family income (either absolute or relative). We believe that those initiatives aimed at promoting higher levels of enrollment in ST&E disciplines require including information that stresses the importance and potential contributions that these professionals might have for society. Of course, accurate and update provision of information that will highlight the excess demand and higher wage levels of these professionals will certainly help to surmount the current bottlenecks.

In relation to the individuals education history, we highlighted the positive influence played by attending a technical track at the secondary education in the decision to enroll into a priority field. This result is of vital importance in the aftermath of an education reform that weaken this track of education in the country. In addition, family background and personal characteristics play an important role in the occupation decision. While mothers' education —both in terms of level and specialization in priority fields— have a positive influence, females are less likely to opt for the ST&E disciplines. This differences in perceptions among genders seem to be particularly related to the small proportion of females following a technical track at the secondary school.

The results presented here support the characterization of the choice of an university career as a complex phenomenon, not only related to financial matters. In this sense, differential access to information and social consideration of the different disciplines play a role. In this sense, it is a prerequisite for an effective policy intervention to act in two complementary dimensions: (a) public provision of information and (b) improving the “public image” that priority fields have.

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## A Participant countries on international tests

LAB (1997)	PISA (2000)	PIRLS (2001)	PISA (2006)
Argentina <sup>1</sup>	Albania	Argentina <sup>1</sup>	Albania
Bolivia <sup>1</sup>	Argentina <sup>1</sup>	Belize	Argentina <sup>1</sup>
Brazil <sup>1</sup>	Australia <sup>2</sup>	Bulgaria	Australia <sup>2</sup>
Chile <sup>1</sup>	Austria <sup>2</sup>	Canada* <sup>2</sup>	Austria <sup>2</sup>
Colombia <sup>1</sup>	Belgium <sup>2</sup>	Colombia <sup>1</sup>	Azerbaijan
Costa Rica <sup>1</sup>	Brazil <sup>1</sup>	Cyprus	Belgium <sup>2</sup>
Cuba <sup>1</sup>	Bulgaria	Czech Republic <sup>2</sup>	Brazil <sup>1</sup>
Honduras <sup>1</sup>	Canada <sup>2</sup>	England <sup>2</sup>	Bulgaria
Mexico <sup>1</sup>	Chile <sup>1</sup>	France <sup>2</sup>	Canada <sup>2</sup>
Paraguay <sup>1</sup>	Czech Republic <sup>2</sup>	Germany <sup>2</sup>	Chile <sup>1</sup>
Peru <sup>1</sup>	Denmark <sup>2</sup>	Greece <sup>2</sup>	China (Shanghai)
Dominican Republic <sup>1</sup>	Finland <sup>2</sup>	Hong Kong	Chinese Taipei
Venezuela <sup>1</sup>	France <sup>2</sup>	Hungary <sup>2</sup>	Colombia <sup>1</sup>
	FYR Macedonia	Iceland <sup>2</sup>	Croatia
	Germany <sup>2</sup>	Iran	Czech Republic <sup>2</sup>
	Greece <sup>2</sup>	Israel	Denmark <sup>2</sup>
	Hong Kong China	Italy <sup>2</sup>	Estonia
	Hungary <sup>2</sup>	Kuwait	Finland <sup>2</sup>
	Iceland <sup>2</sup>	Latvia	France <sup>2</sup>
	Indonesia	Lithuania	Germany <sup>2</sup>
	Ireland <sup>2</sup>	FYR Macedonia	Greece <sup>2</sup>
	Israel	Moldova	Hong Kong-China
	Italy <sup>2</sup>	Morocco	Hungary <sup>2</sup>
	Japan <sup>2</sup>	Netherlands <sup>2</sup>	Iceland <sup>2</sup>
	Japan <sup>2</sup>	New Zealand <sup>2</sup>	Indonesia
	Korea <sup>2</sup>	Norway <sup>2</sup>	Ireland <sup>2</sup>
	Latvia	Romania	Israel
	Liechtenstein	Russian Federation	Italy <sup>2</sup>
	Luxembourg <sup>2</sup>	Scotland <sup>2</sup>	Japan <sup>2</sup>
	Mexico <sup>1,2</sup>	Singapore	Jordan
	New Zealand <sup>2</sup>	Slovak Republic <sup>2</sup>	Korea <sup>2</sup>
	Norway <sup>2</sup>	Slovenia	Kyrgyz Republic
	Peru <sup>1</sup>	Sweden <sup>2</sup>	Latvia
	Poland <sup>2</sup>	Turkey <sup>2</sup>	Liechtenstein
	Portugal <sup>2</sup>	United States <sup>2</sup>	Lithuania
	Russian Federation		Luxembourg <sup>2</sup>
	Spain <sup>2</sup>		Macao-China
	Sweden <sup>2</sup>		Macedonia
	Switzerland <sup>2</sup>		Mexico <sup>1,2</sup>
	Thailand		Netherlands <sup>2</sup>
	United Kingdom <sup>2</sup>		New Zealand <sup>2</sup>
	United States <sup>2</sup>		Norway <sup>2</sup>
			Panama <sup>1</sup>
			Peru <sup>1</sup>
			Poland <sup>2</sup>
			Portugal <sup>2</sup>
			Qatar
			Republic of Montenegro
			Republic of Serbia
			Romania
			Russian Federation
			Singapore
			Slovak Republic <sup>2</sup>
			Slovenia
			Spain <sup>2</sup>
			Sweden <sup>2</sup>
			Switzerland <sup>2</sup>
			Thailand
			Tunisia
			Turkey <sup>2</sup>
			United Kingdom <sup>2</sup>
			United States <sup>2</sup>
			Uruguay <sup>1</sup>

Table 23: Countries participating in different international education tests. Notes: (1) Latin American countries, (2) OCDE member countries, (3) Only for Ontario and Quebec.

## B Determining the Selection equation

The results presented in Section 8 require specifying a selection equation. In this case, our selection equation refers to the explanatory factors behind the decision to continue studying at the university. This decision made by individuals is expected will be positively affected by individual abilities and past performance, the family income and parents' attendance to higher education. It seems plausible that high school on a private school will have a positive effect on the decision to pursue this type of studies. Additionally, and as control variables, we included in our explorations factors related to age, gender. Table 24 presents the results of three specifications of the selection equation that include personal and background factors.

Explanatory factors	Selection equation: 3 specifications		
	Model family 1	Model family 2	Model family 3
	Sign & significance	Sign & significance	Sign & significance
Gender <sup>a</sup>	-0.289**	-0.227	-0.264
Age	-0.348***	-0.298***	-0.326***
Private education	0.374***	0.433***	0.400**
Technical track	0.278**	0.533***	0.609***
Good math performance <sup>b</sup>	0.248**	0.278**	0.305**
Good language performance <sup>b</sup>	0.237*	0.516***	0.538***
Family income		0.132***	0.092**
Father's higher education <sup>c</sup>			—
Mother's higher education <sup>c</sup>			0.394**
<b>Prob. LR</b>	<b>**</b>	<b>***</b>	<b>***</b>

Table 24: Sign, significance levels and marginal effects for the explanatory factors of the probability of choosing a priority field. Notes: a: 0-Male & 1-Female; b: 0-Regular and bad performance & 1-Passed without problems; c: Not attended higher education & 1: Attended higher education. Significance: “—” not significant, \* 10%, \*\* 5%, \*\*\* 1%.

Additionally, we estimated a set of different equations including the level of self-reported level or preparation, their expectation about reaching post-graduate studies, receiving scholarships and nationality. None of these specifications added explanatory power, being these factors not statistically significant. Similar results produced the inclusion of their perception about average income expectations from the graduates.

## C Results for outcome and selection equations

Personal, Family factors and Perceptions about careers (I)				
	Coefficients	S.E.	Marginal effects for	
			positive outcome	outcome/selection=1    selection=1
<i>Outcome equation</i>				
Gender	-0.456	0.118***	-0.179	-0.315
Age	0.268	0.091***	0.106	0.071
Technical track	0.276	0.091	0.109	0.401
Private education	-0.172	0.118		
Maths performance	0.076	0.017***	0.030	0.139
Language Performance	-0.230	0.234		
Family income	-0.035	0.018**	-0.141	
Priority father	-0.187	0.147		
Priority mother	0.494	0.385		
Expected income	0.037	0.214*	0.014	0.022
<i>Selection equation</i>				
Gender	-0.137	0.125		
Age	-0.232	0.077***		-0.083
Technical track	0.762	0.113***		0.252
Private education	0.457	0.113***		0.153
Maths performance	0.236	0.094**		0.086
Family income	0.104	0.031***		0.037
Higher ed. father	-0.255	0.162		
Higher ed. mother	0.277	0.101***		0.098
Test Independence	0.02**			
Prob LR			***	
<i>n</i>			<b>289</b>	

Table 25: Sign and significance levels for the explanatory factors of the probability of choosing a priority field including expected income(Stage 1). S.E. refers to Robust standard errors. Significance: \* 10%, \*\* 5%, \*\*\* 1%. Marginal effects are presented for significant factors only.

<b>Personal, Family factors and Perceptions about careers (II)</b>				
	Coefficients	S.E.	Marginal effects for	
			positive outcome	outcome/selection=1    selection=1
<i>Outcome equation</i>				
Gender	-0.758	0.180***	-0.193	-0.238
Age	-0.032	0.098		
Technical track	0.755	0.188***	0.202	0.205
Private education	0.118	0.209		
Maths performance	0.352	0.198*	0.080	0.078
Language Performance	0.226	0.223		
Family income	0.009	0.019		
Priority father	0.131	0.296		
Priority mother	0.199	0.416		
Demand	0.711	0.174***	0.172	0.231
<i>Selection equation</i>				
Gender	-0.196	0.180		
Age	-0.339	0.081***		-0.109
Technical track	0.597	0.184***		0.179
Private education	0.346	0.200*		0.104
Maths performance	0.359	0.161**		0.120
Language Performance	0.515	0.182***		0.179
Family income	0.106	0.038***		0.034
Higher ed. father	-0.172	0.215		
Higher ed. mother	0.403	0.193**		0.126
Test Independence	0.115			
Prob LR			***	
<i>n</i>			<b>340</b>	

Table 26: Sign and significance levels for the explanatory factors of the probability of choosing a priority field including high labor demand (Stage 1). S.E. refers to Robust standard errors. Significance: \* 10%, \*\* 5%, \*\*\* 1%. Marginal effects are presented for significant factors only.

<b>Personal, Family factors and Perceptions about careers (III)</b>				
	Coefficients	S.E.	Marginal effects for	
			positive outcome	outcome/selection=1    selection=1
<i>Outcome equation</i>				
Gender	-0.873	0.177***	-0.233	-0.288
Age	-0.046	0.093		
Technical track	0.736	0.186***	0.204	0.203
Private education	0.107	0.205		
Maths performance	0.374	0.192*	0.089	0.087
Language Performance	0.296	0.217		
Family income	0.009	0.018		
Priority father	-0.011	0.280		
Priority mother	0.282	0.399		
Social Value	0.337	0.170**	0.085	0.116
<i>Selection equation</i>				
Gender	-0.214	0.180		
Age	-0.342	0.082***		-0.112
Technical track	0.614	0.183***		0.187
Private education	0.361	0.198*		0.110
Maths performance	0.363	0.163**		0.122
Language Performance	0.482	0.182***		0.168
Family income	0.098	0.037***		0.032
Higher ed. father	-0.02	0.213		
Higher ed. mother	0.351	0.197*		
				-0.034    0.111
Test Independence	0.176			
Prob LR			***	
<i>n</i>			<b>334</b>	

Table 27: Sign and significance levels for the explanatory factors of the probability of choosing a priority field including perceptions about social value (Stage 1). S.E. refers to Robust standard errors. Significance: \* 10%, \*\* 5%, \*\*\* 1%. Marginal effects are presented for significant factors only.

<b>Personal, Family factors and Perceptions about careers (IV)</b>				
	Coefficients	S.E.	Marginal effects for	
			positive outcome	outcome/selection=1    selection=1
<i>Outcome equation</i>				
Gender	-0.908	0.168***	-0.247	-0.294
Age	0.169	0.089		
Technical track	0.708	0.176***	0.202	0.201
Private education	0.062	0.193		
Maths performance	0.325	0.178*	0.080	0.077
Language Performance	0.252	0.203		
Family income	-0.009	0.017		
Priority father	0.013	0.278		
Priority mother	0.172	0.379		
Individual respect	0.044	0.183		
<i>Selection equation</i>				
Gender	-0.253	0.172		
Age	-0.336	0.080***		-0.103
Technical track	0.564	0.179***		0.161
Private education	0.421	0.191**		0.120
Maths performance	0.328	0.157**		0.104
Language Performance	0.520	0.178***		0.174
Family income	0.104	0.036***		0.032
Higher ed. father	-0.108	0.209		
Higher ed. mother	0.368	0.191**		
			-0.003	0.110
Test Independence	0.08*			
Prob LR			***	
<i>n</i>			<b>363</b>	

Table 28: Sign and significance levels for the explanatory factors of the probability of choosing a priority field including opinions about individual respect (Stage 1). S.E. refers to Robust standard errors. Significance: \* 10%, \*\* 5%, \*\*\* 1%. Marginal effects are presented for significant factors only.



<b>Personal, Family factors and combined perceptions about careers (I)</b>				
	Coefficients	S.E.	Marginal effects for	
			positive outcome	outcome/selection=1    selection=1
<i>Outcome equation</i>				
Gender	-0.516	0.215**	-0.202	-0.346
Age	0.264	0.111**	0.105	
Technical track	0.227	0.029***		0.376
Private education	-0.180	0.232		
Maths performance	0.044	0.213		
Language Performance	-0.308	0.257		
Family income	-0.041	0.020**	-0.016	
Priority father	-0.262	0.369		
Priority mother	0.518	0.481		
Expected income	0.034	0.029		
Social Value	0.465	0.187**	0.185	0.275
<i>Selection equation</i>				
Gender	-0.127	0.183		
Age	-0.241	0.088***		-0.087
Technical track	0.761	0.209***		0.255
Private education	0.428	0.214**		0.145
Maths performance	0.275	0.170*		0.101
Language Performance	0.628	0.201***		0.238
Family income	0.099	0.034***		0.036
Higher ed. father	-0.095	0.206		
Higher ed. mother	0.218	0.201		
Test Independence	0.009***			
Prob LR			***	
<i>n</i>			<b>284</b>	

Table 29: Sign and significance levels for the explanatory factors of the probability of choosing a priority field including opinions about individual respect (Stage 2). S.E. refers to Robust standard errors. Significance: \* 10%, \*\* 5%, \*\*\* 1%. Marginal effects are presented for significant factors only.

<b>Personal, Family factors and combined perceptions about careers (II)</b>				
	Coefficients	S.E.	Marginal effects for	
			positive outcome	outcome/selection=1    selection=1
<i>Outcome equation</i>				
Gender	-0.521	0.196***	-0.205	-0.368
Age	0.298	0.103***	0.119	
Technical track	0.232	0.021***		0.372
Private education	-0.151	0.139		
Maths performance	-0.054	0.138		
Language Performance	-0.275	0.266		
Family income	-0.039	0.018***	-0.015	
Priority father	-0.317	0.356		
Priority mother	0.598	0.363*	0.222	0.332
Expected income	0.044	0.030		
Social Value	0.421	0.184**	0.168	0.249
Demand	0.506	0.165***	0.202	0.300
<i>Selection equation</i>				
Gender	-0.172	0.169		
Age	-0.235	0.077***		-0.085
Technical track	0.716	0.202***		0.241
Private education	0.425	0.148***		0.144
Maths performance	0.272	0.203**		0.099
Language Performance	0.604	0.192***		0.228
Family income	0.103	0.004***		0.037
Higher ed. father	-0.163	0.171		
Higher ed. mother	0.331	0.181*		0.117
Test Independence	0.02**			
Prob LR			***	
<i>n</i>			<b>283</b>	

Table 30: Sign and significance levels for the explanatory factors of the probability of choosing a priority field including opinions about individual respect (Stage 2). S.E. refers to Robust standard errors. Significance: \* 10%, \*\* 5%, \*\*\* 1%. Marginal effects are presented for significant factors only.

## D Questionnaire

### Personal data:

1. Gender

<input type="checkbox"/>	Male
<input type="checkbox"/>	Female

2. Age: ..... (in years)

3. Place of birth (City, Province, Country): .....

### Family data:

4. Please, indicate in the following table the age (in years) and relation with your family members. If you have any brothers or sisters, only include the details referred to those older than you:

	Member 1	Member 2	Member 3	Member 4	Member 5
Relation					
Age					

5. Please complete in the following table the higher level of education for each of the member previously mentioned (use an X). For those who attended the university, write down the name of the career that they followed.

#### Mark with an X the higher education level obtained:

	Member 1	Member 2	Member 3	Member 4	Member 5
Incomplete primary					
Complete primary					
Incomplete high school					
Complete high school					
Incomplete tertiary					
Complete tertiary					
Incomplete university					
Complete university					
Postgraduate studies					

#### Name of the career for those who attended university:

Name of the career					
--------------------	--	--	--	--	--

6. Could you tell us what they did on the previous week (mark with an X). For those who worked, please tell us what occupation they have.

**Mark with an X what they did on the previous week:**

	Member 1	Member 2	Member 3	Member 4	Member 5
Occupied					
Student					
Worked and studied					
Ama de casa					
Retired					
Complete tertiary					
Unemployed					

**For those working, name the occupation:**

Name of the occupation					
------------------------	--	--	--	--	--

### Future plans:

7. What are your plans after you finish high school? (Mark with an X):

	a. Study in the university ( <i>Go to question 9</i> )
	b. Study in a tertiary institute ( <i>Go to question 9</i> )
	c. Only work ( <i>Go to question 8</i> )
	d. Have not decided yet ( <i>Go to question 9</i> )

8. Could you tell us which is the main reason why you are not going to continue studying? (Mark with an X):

	a. Studying is not necessary to be successful
	b. I want to study
	c. I don't have the ability to continue studying
	d. I wouldn't know what to study
	e. I don't have enough information to decide what to study
	f. None of my friends are planning to continue studying
	g. I would like to do other things before studying
	h. I need to work

9. Do you parents want you to continue studying (either at a tertiary or university)?

<input type="checkbox"/>	Yes ( <i>Go to question 10</i> )
<input type="checkbox"/>	No ( <i>Go to question 11</i> )

10. What is the main reason why the want you to continue studying?

<input type="checkbox"/>	a. Allows better jobs
<input type="checkbox"/>	b. Enables higher wages
<input type="checkbox"/>	c. Provides higher reputation
<input type="checkbox"/>	d. Everybody else studies

## Choice of an university career

11. Which career do you find the most attractive to study at the university?

.....

12. Could you indicate the second most attractive career to study at the university?

.....

13. Indicate the two most important factors that make a certain career attractive (Mark with an X on each column of the following table)

<b>Factors</b>	<b>1st most important factor (mark with an X)</b>	<b>2nd most important factor (mark with an X)</b>
Guarantee an important salary		
Allow me to work on different occupations		
Allow me to develop and use my creativity		
Pose me intellectual challenges		
Contribute to society		
Provide me social recognition		
Ease my participation in politics		
Improve my social position		

14. Which career would your parents prefer for you?

Father	
Mother	

15. Could you mention up to two suggestions that you have received from professors?

1.....

2.....

### Expectations:

16. Please indicate how important are each of the following factors to be successful in life.

<b>Factors</b>	Very important	Something important	Barely Important	Of little importance	Not important at all
a. Occupation one follows					
b. Social origin					
c. Being intelligent					
d. Attend university					
e. Having contacts					

17. Indicate the two most important objectives that you are planning to achieve.

<b>Factors</b>	<b>1st most important objective</b> (mark with an X)	<b>2nd most important objective</b> (mark with an X)
Obtain social recognition		
Maintain an active social life		
Combine work with family		
Make money		
Pose intellectual challenges		
Have a stable job		

## D.1 Education data

18. Please, tell us how was your performance at language and maths courses last year

	Passed it without problem	I had trouble passing it	I only passed it after the summer exams	I need to take the exams again this year
Maths				
Language				

19. Could you please indicate us how frequent the following events occur in your high school?

	Every day	Once a week	Once a month	Once a semester	Once a year
a. Having exams or delivering homework					
b. Having sciences classes using labs or making experiments					
c. Having classes assisted by videos, computers or movies					
d. Visiting museums or going on fieldtrips					
e. Not having classes because the teachers don't show					
f. Not having classes because of strikes					

20. How would you calificate the following aspects of your secondary education and school?

	Very good	Good	Average	Bad	Poor
a. Lectures quality					
b. Evaluation criteria					
c. School physical condition					
d. Information about careers					
e. Scholarships schemes					

21. How do you consider yourself in the following dimensions?

	Very good	Good	Average	Bad	Poor
a. Command of foreign languages					
b. Expression skills (written & oral)					
c. Ability to organize myself					
d. Attracting other's attention with my opinions					
e. Capacity to work in teams					
f. Capacity to propose ideas					

22. How much your parents care about your studies and your performance at school?

	A lot	Enough	Little	Very little	Nothing at all
a. Do they help you when you need to study?					
b. How much they know about your performance?					
c. How much they care about your performance?					



### More on your future plans

30. Are you planning to work while studying at the university?

	Yes		No
--	-----	--	----

34. How ready you think you are for continuing your studies?

Highly ready	
Ready	
Little ready	
Not ready at all	

35. How likely is that you will finish your studies?

Very likely	
Likely	
Little likely	
Not likely at all	

36. Do you picture yourself pursuing postgraduate studies?

Yes ..... No.....

## Career charecteristics

38. Select among the following options related to the type of skills that you expect to acquire during your career the one that defines better your situation:

My career will prepare me for only one occupation	
My career will allow me flexibility to work on a wide array of occupations	
My career will provide me general skills that can be used on every occupation	

39. Select among the following options related to the type of knowledge that you expect to acquire during your career the one that defines better your situation:

My career will provide me knowledge to apply on the job	
The important knowledge is acquired at work and not during your studies	
The most important about university is to obtain a degree and not what you study	

40. Indicate whether the following propositions are true or false:

Being a lawyer provides more prestige than being an engineer	
A lawyer has a higher income than an engineer	
Lawyers enjoy more and better contacts than an engineer	
Argentina requires more engineers	
Argentina requires more lawyers	
Being an engineer in Argentina is frustrating	
Studying careers related with science & technology is for rich people	
Studying careers related with science & technology requires abilities that I don't have	
Studying careers related with science & technology is difficult because of the poor high school level	

41. Given the following lists of careers, please indicate the monthly income for a graduate on each of them: .

<b>Career</b>	<b>Monthly income</b> (Argentinean pesos)
Physics	
Law	
Informatics	
Business administration	
Engineer	
Sociology	
Psychology	
Medicine	
Design (image, fashion, industrial)	
(If it is not here:) Your career	
Architecture	

42. How much the society respect the professionals from the following list of careers

<b>Career</b>	<b>Enormously</b>	<b>A lot</b>	<b>Average</b>	<b>Little</b>	<b>Not at all</b>
Physics					
Law					
Informatics					
Business administration					
Engineer					
Sociology					
Psychology					
Medicine					
Design (image, fashion, industrial)					
(If it is not here:) Your career					
Architecture					

43. Please, indicate how you consider a professional from the following university careers.

<b>Career</b>	<b>Very high</b>	<b>High</b>	<b>Average</b>	<b>Little</b>	<b>Very little</b>
Physics					
Law					
Informatics					
Business administration					
Engineer					
Sociology					
Psychology					
Medicine					
Design (image, fashion, industrial)					
(If it is not here:) Your career					
Architecture					

44. Given the list of the following careers, please indicate the three exhibiting the higher labour demand for its graduates:

<b>Career</b>	<b>1st Higher demand</b>	<b>2nd Higher demand</b>	<b>3rd Higher demand</b>
Physics			
Law			
Informatics			
Business administration			
Engineer			
Sociology			
Psychology			
Medicine			
Design (image, fashion, industrial)			
(If it is not here:) Your career			
Architecture			

## Information and strategies

45. Which of the following aspects have you discuss with your parents, friends, professors and other people? Please, rank the received information from 1(maximum) to 4 (minimum) according to the importance you assigned to it.

I have discussed this with...				
Rank them from 1 to 4, being: 1: Very important, 2: Important, 3: Of little importance, 4: Not important at all				
Type of information	Parents	Friends	Professors	Others
Graduates wages Physics				
Difficulty of the studies				
Careers with the highest labour demand				
Prestige of the different professionals				

46. To what extent the following statements describe your present situation:

Statement	Describes my situation...				
	Very good	Good	To some extent	Very little	Not at all
I would like to have more information about my choice					
I don't know how to obtain relevant information about the alternatives					
I don't believe that the choice is something to be concerned about					
I would like to talk with somebody working on my career					

47. With what frequency have you done/participated the following activities to investigate what and where to study?

<b>Actions</b>	<b>Very frequently</b>	<b>Frequently</b>	<b>Some tomes</b>	<b>A few times only</b>	<b>Never</b>
In school we had time devoted to the career choice and guidance					
We had vocational tests in school					
I met with a career counselor					
I spoke with my friends					
I spoke with my parents					
I contacted people working or studying in interesting fields					
I bought and read books and magazines about the alternatives					

## D.2 Family data

48. Please, indicate your parents' monthly income (in Argentinean pesos)

.....

49. Do you receive any type of scholarship?

<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
--------------------------	-----	--------------------------	----

50. Was any of your parents born in a country different from Argentina? If that is the case, please tell us who did and where.

Father	
Mother	

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